CONCLUDING REMARKS FOR SECTION I*

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I think the quest for nonthrombogenic surfaces would be simply fun if no one were dying for the answer. Since many are, there is some urgency to our discussion and some tragedy in our failures. Our meeting has pointed out some of these failures, and will have been successful even if it will have taught us nothing but modesty.

We must no longer fail to see the difference, as pointed out by Dr. Edwin W. Salzman, between clotting and thrombosis. What events initiate either? Must they be totally prevented or do they contain desirable sequences, and should we aim for those leading to the formation of no more or no less than a single platelet layer?

Our own work suggests that adsorption of factors XII and XI initiates clotting, and that adsorption of fibrinogen initiates platelet adhesion, unless the fibrinogen film is converted by the intact plasma. However, I am sure the interactions between flowing blood and a solid surface are not governed merely by the behavior of two or three protein species; or even if we are lucky enough to find that nature has limited itself to these, it certainly has selected some very complex conformation to express itself in. Both factor XII and fibrinogen will not be surprised to hear Dr. Philip N. Sawyer now cautioning us that distribution of charge, as well as net charge, may govern thrombogenicity, or to hear Dr. Robert E. Baier caution us that a rather narrow range rather than an extremely low critical surface tension may have to be sought, and that both surface energy and charge are important.

Perhaps these solid-surface properties are drastically altered or even equalized by the choice and orientation of protein they select for adsorption. However, it seems to me that each choice made by the sur-

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face leads to its own set of other choices, and so on. What Dr. Leonard has told us about possible effects of flow, seemingly random, can also be seen to amplify the number of possibilities with time, starting almost immediately upon contact of the implant with blood.

Dr. Hymie L. Nossel has shown quite clearly that the roles of factors XII and XI in thrombogenesis are not quite clear and that they are complicated by the possibility of negative feedback systems leading to inhibition or digestion of dangerous products. Dr. Theodore H. Spaet has demonstrated that thromboresistant structures in nature are quite complex; the response of endothelium to material that displaces it must also be varied and complex.

I believe the best part of this meeting has been our discussion, which has suggested that none of us have sufficient knowledge, insight, equipment, or personnel to solve the large number of surface chemical, biochemical, cytological, and perhaps immunochemical problems hidden by the one word "thrombogenicity." The best we can all hope to have is each other.